Abstract No. gonc539

X-ray Diffraction at Low Temperatures and High Pressures at X17B and X17C Beamlines of the NSLS

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Beamline(s): X17C, X17B1

Results: We report the development of x-ray cryostats (capable of working to l-He temperatures) for single-crystal and powder diffraction studies with synchrotron radiation. Both cryostats can be used with diamond anvil cells capable of generating ultrahigh static pressures (above 100 GPa). A special optical Raman/fluorescence system was used in situ for further sample characterization and pressure measurements (with a ruby gauge). The single-crystal cryostat is designed for use with a white beam in an energy-dispersive mode. In this case, the sample can be rotated inside the cryostat with respect to the omega and chi axis to match the Bragg conditions. For powder diffraction studies, a focused monochromatic beam and position sensitive detector was used. Examples of samples studied include Re, Fe,Fe_3O_4, H_2-H_2O, CoO and are reported separately.

Acknowledgments: This work is supported by NSLS, NSF, DOE and W. M. Keck Foundation.

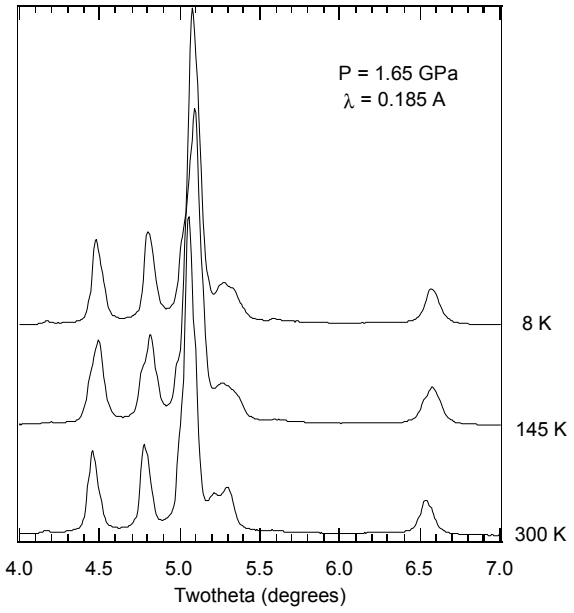

Fig. 1. X-ray powder diffraction patterns of Re at different temperatures.

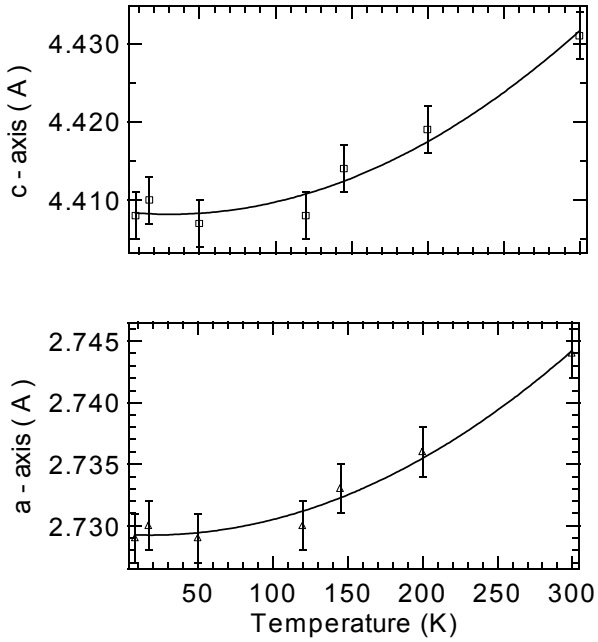

Fig. 2. Lattice parameters of Re at 1.6 Gpa as a function of temperature.